REMARKS/ARGUMENTS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-11 are pending in the present application. No claims are amended, canceled or added by the present amendment.

In the outstanding Office Action, Claims 1-11 were rejected under 35 U.S.C. § 103(a) as unpatentable over EP 0895 132 A2 to Numazu et al. (herein "Numazu") in view of U.S. Patent No. 6,360,070 to Taka et al. (herein "Taka"). Applicants respectfully traverse that rejection.

Claim 1 is directed to an image forming apparatus that includes, *inter alia*, at least one first image carrier configured to carry a chromatic color toner image, a second image carrier configured to carry a black toner image, at least one first gear configured to rotate to drive the at least one first image carrier to rotate, and a second gear configured to rotate to drive the second image carrier to rotate. In addition, the image forming apparatus includes a control device configured to control respective rotation stop-positions of the at least one first gear and the second gear. In a color mode, a color image is formed by transferring the chromatic color toner image formed on the at least one first image carrier onto a transfer material and by transferring the black toner image formed on the second image carrier onto the transfer material while superimposing each other on the transfer material. In a monochrome mode, a black image is formed by halting the at least one first gear and the at least one first image carrier and by transferring the black toner image formed on the second image carrier onto the transfer material. In the color mode, the control device controls the at least one first gear and the second gear to stop rotating at positions different from rotation start-positions of the at least one first gear and the second gear, respectively, while maintaining a predetermined phase relation between the at least one first gear and the second gear. In the monochrome

mode, the control device controls the second gear to stop rotating at a position substantially equal to a rotation start-position of the second gear.

In a non-limiting embodiment, Applicant's Figures 2 and 3 show a portion of an image forming apparatus that includes a black gear 32bk (e.g., second gear) and a color gear 32c (e.g., first gear). Sensors 55C and 55BK detect reference protrusions 54C and 54BK, respectively. When a first image forming operation in the color mode is completed, the controller 60 (e.g., control device) outputs motor stop signals based on detection signals generated by the sensors 55C and 55BK. With the motor stop signals, the drive motors 35 and 135 stop, thereby stopping the rotations of the color gears 32Y, 32M, 32C and the black gear 32BK. When a second image forming operation in the color mode starts, the drive motors 35 and 135 are actuated, thereby rotating the color gears 32Y, 32M, 32C and the black gear 32BK. At this time, the color gears 32Y, 32M, 32C and the black gear 32BK start rotating from the positions where the gears 32Y, 32M, 32C and 32BK stop in the preceding image forming operation.

When the second image forming operation is completed, the controller 60 outputs motor stop signals after a predetermined time, e.g., 10 microseconds, has elapsed from when the sensors 55C and 55BK detect the reference protrusions 54C and 54BK, respectively. With the motor stop signals, the drive motors 35 and 135 stop, thereby stopping the rotations of the color gears 32Y, 32M, 32C and the black gear 32BK. Thus, the stop-positions of the color gears 32Y, 32M, 32C and the black gear 32BK in the second image forming operation are different from their stop-positions in the first image forming operation, respectively.

When the third image forming operation in the color mode is completed, the controller 60 outputs motor stop signals after a predetermined time, which is longer than that in the second image forming operation, e.g., 20 microseconds, has elapsed from when the sensors 55C and 55BK detect the reference protrusions 54C and 54BK, respectively. With

the motor stop signals, the drive motors 35 and 135 stop, thereby stopping the rotations of the color gears 32Y, 32M, 32C and the black gear 32BK. Thus, the stop-positions of the color gears 32Y, 32M, 32C and the black gear 32BK in the third image forming operation are different from their stop-positions in the second image forming operation, respectively.

With the above-described control operation of the rotation stop-positions of the gears, the color gears 32Y, 32M, 32C and the black gear 32BK stop at positions different from their rotation start-positions, respectively. Therefore, when the color gears 32Y, 32M, 32C and the black gear 32BK stop rotating, the color gears 32Y and 32M sequentially engage with the output gear 136 at different positions, the color gears 32M and 32C sequentially engage with the intermediate gear 53 at different positions, and the black gear 32BK sequentially engages with the output gear 36 at different positions. Thus, local abrasions of the gears 32Y, 32M, 32C and 32BK are prevented, thereby extending useful life of the drive gears 32Y, 32M, 32C and 32BK. Further, the photoreceptors 3BK, 3C, 3M, and 3Y respectively stop at positions different from their rotation start-positions.

As described above, the color gears 32Y, 32M, 32C and the color photoreceptors 3Y, 3M, 3C are halted in the monochrome mode. In the monochrome mode, if the rotation stop-position of the black gear 32BK is controlled as above, desired phase relations between the color gears 32Y, 32M, 32C and the black gear 32BK become undesirable. To maintain the desired phase relations between the color gears 32Y, 32M, 32C and the black gear 32BK, when an image forming operation in the monochrome mode is completed, the black gear 32BK is controlled to stop at a position equal to its rotation start-position. For example, when the sensor 55BK detects the reference protrusion 54BK when a preceding image forming operation in the monochrome mode is completed, the controller 60 outputs a motor stop signal, thereby stopping the rotation of the black gear 32BK. Further, when the sensor 55BK detects the reference protrusion 54BK when a succeeding image forming operation in

the monochrome mode is completed, the drive motor 35 is stopped in accordance with a motor stop signal output from the controller 60. At this time, the black gear 32BK is stopped at the position where the black gear 32BK starts rotating in the succeeding image forming operation in the monochrome mode (i.e., the rotation start-position).

Thus, according to the claimed invention, the control device controls the black gear and the color gear to stop rotating at positions different from their start positions while maintaining a phase relation in the color mode, and the control device controls the black gear to stop rotating at its start position when in the monochrome mode.

Applicant respectfully submits that Numazu and Taka do not teach or suggest each of the features of the claimed invention. In particular, Taka and Numazu do not teach or suggest a control device that controls a second gear to stop rotating at a position substantially equal to a rotation start position of the second gear when in a monochrome image forming mode. As noted in the outstanding Office Action, Numazu fails to disclose a control device that controls a second gear to stop rotating at a position substantially equally to a rotation start-position of the second gear in a monochrome mode.[1] Further, Applicant respectfully traverses the assertion in the outstanding Office Action that Taka discloses that feature.[2]

In particular, Applicant respectfully notes that none of the passages from Taka cited in the outstanding Office Action (i.e., column 17, lines 30-35; column 22, lines 36-57; column 23, lines 24-32 and 62-66; column 26, lines 42-45; and Figure 5) teach or suggest that feature. In particular, Taka at column 17, lines 30-55, merely indicates that all the photosensitive drums 222a-222d (e.g., first and second image carriers) start and stop rotating simultaneously and are stopped with their stop positions "shifted from one another at their initialization, setting a phase shifted state."[3] Thus, Taka indicates that all of the drums are stopped with their stop positions different than their start positions but does not indicate a

[1] Office Action at page 4, second paragraph.
[2] Office Action at page 5, lines 5-7.
[3] Taka at column 17, lines 39-43.

monochrome mode in which the control device controls the black gear to stop rotating at the same position from which it started. Further, at column 22, lines 36-57, Taka merely indicates that the stop positions of photosensitive drums 222a-222d are shifted while keeping the predetermined phase angles from one to the next when the number of starts or stops of driving reaches a predetermined number of times.[4] Thus, in this passage, as above, Taka fails to teach or suggest any monochrome mode in which the control device controls the black gear to stop rotating at a position substantially equal to a rotation start position. Further, at column 23, lines 24-32 and 62-66, and at column 26, lines 42-45 Taka merely describes the same situation as discussed above in which all of the drums are rotated to remain in phase and Taka does not teach or suggest any monochrome mode in which a "control device controls a second gear to stop rotating at a position substantially equal to a rotation start-position of the second gear," as recited in independent Claim 1 and as similarly recited in independent Claims 5 and 8.

In addition, Applicant respectfully points out that in another passage, not cited in the Office Action, Taka describes a color image forming apparatus that can reproduce monochrome images and that only the needed recording portions may be operated while the others which are not engaged with the image reproduction may be stopped.[5] However, even in that passage, Taka does not indicate that a control device controls the second gear to stop rotating at a position substantially equal to a rotation start position of the second gear in the monochrome mode. Further, Taka indicates that such a monochrome reproducing apparatus may be configured so that the stop position control of the photosensitive drums will always be performed after the performance of monochrome image forming.[6] However, Taka is silent regarding the details of the claimed invention and in particular, fails to teach or suggest any image forming apparatus with a control device that "controls the second gear to stop rotating

[4] Taka at column 22, lines 40-43.
[5] Taka at column 22, lines 2-5.
[6] Taka at column 22, lines 6-9.

at a position substantially equal to a rotation start-position of the second gear in the monochrome mode," as recited in independent Claim 1 and as similarly recited in independent Claims 5 and 8.

Accordingly, Applicant respectfully submits that independent Claims 1, 5 and 8, and claims depending therefrom, are allowable.

Consequently, in light of the above discussion, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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